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ABSTRACT

This report proposes a preliminary basic math program that may help mitigate the student attrition problem at Contra Costa College (California). For the purposes of this proposal, Math 101, 115, and 118 are identified as courses to be included in the program. The essential features of this proposed curriculum are summarized as follows: (1) it maintains the fixed unit/lecture format as its core; (2) it develops a safety net to assist at-risk students who are having difficulty with the fixed unit/lecture courses and helps them transfer into variable unit/self-paced courses; and (3) it develops variable unit/self-paced alternatives for all basic math courses. The report recommends a division of the fixed unit/lecture courses into two sequential variable unit/self-paced courses, which devote half of the class time to lectures and half to study hall. These classes would cover only half of what the original course did in the same amount of time, slowing down the pace and allowing more of the at-risk students to keep up with the class. (AS)

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A Preliminary "Basic Math Program" Proposal

Richard Luhring

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Date : 21 April 1997

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Subject : A Preliminary "Basic Math Program" Proposal

The following preliminary proposal for a Basic Math Program addresses the student attrition problem which Dr. Rose discussed in our All College Day meeting at the beginning of this semester. For the purposes of this proposal, Math 101, 115, and 118 are the courses included in the Basic Math Program. The essential features of this program can be summarized as:

1. Maintain the "Fixed Unit / Lecture" format as the core for the program since this format appears to be the most effective way of getting "academically mature" students through a course in one semester.

2. Develop a "safety net" to assist students who are having difficulty with the "Fixed Unit / Lecture" courses and help them transfer into "Variable Unit / Self-Paced" courses.

3. Develop "Variable Unit / Self-Paced" alternatives for all Basic Math courses. Both Lynn Stone and I have been using "Variable Unit / Self-Paced" formats during the past couple of years, and while her methods have been more effective than mine, there are reasons for being cautious about applying her methods directly to other instructors. The alternative I am recommending is to divide the "Fixed Unit / Lecture" courses into two sequential "Variable Unit / Self-Paced" courses which devote approximately half of their time to "study hall" activities.

Each of these three features will be developed more thoroughly in subsequent pages of this document. Data supporting this proposal comes from the semester reports I have been distributing during the past couple of years. Only that data most directly associated with the recommendations of this proposal will be presented in this document.

The "preliminary" nature of this proposal needs to be stressed. It was only during the past semester, Fall '96, that the focus of my attention changed from evaluating the effectiveness of a "computerized" Math 101 course to the broader issue of a Basic Math Program covering Math 101, 115, and 118. Rather than expecting anyone to make final decisions based on current data, it seems more appropriate to merely present this data with the intention of having it evaluated on whether it adequately describes the essential aspects of the Basic Math Program being developed.

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I. The Basic Skills Student

When Dr. Rose discussed the "at risk" students who take basic skills classes here at Contra Costa College, she referred to statistics such as, "of 608 successful enrollments in math transfer courses (past Math 120) . . . only 10% were successful enrollments in a prior (Math 118) . . . and only 1% were successful in a prior (Math 101)." She summarized her remarks with, "The majority of students who enter a transfer course and successfully complete it do so without ever having enrolled in any basic skill or Elementary Algebra course at CCC." Thus it is appropriate to discuss the CCC student population as being divided into "transfer" and "basic skills" sub-populations.

Focussing only on the "basic skills" students, we can get further dismal statistics from the Matriculation study upon which Dr. Rose based her statements. For example, if we look at the successful Math 101 enrollments, less than 20% of them pass our Math 118 course, which is the math requirement for the two year degree we offer. Should we be brave enough to examine these statistics even further, we might remind ourselves that they are only counting students who have had at least one successful enrollment and do not recognize the even more discouraging numbers about students who enroll without ever having any success. Rather than becoming completely depressed by these statistics, we must simply accept them as base data against which we can measure the effectiveness of our future efforts to correct some of these problems.

What would be meaningful accomplishments for our Basic Math Program? Since Math 101 provides the basic calculation skills needed in everyday life, merely increasing the percentage of successful enrollments in this course would be a positive, practical accomplishment. Hopefully, we will also be able to improve the percentage of basic skills students who become qualified for our two year degrees. While we would never want to discourage a basic skills student from thinking about transfer possibilities, the statistics which have just been quoted should caution us against measuring the success of the Basic Skills Program only by the percentage of these students who eventually qualify for transfer.

Statistics can be helpful in confirming improvements, but by themselves, they are poor indicators about what should be done to produce improvements. Those directions are better established by the judgment of instructors who are interacting with the students. Accordingly, I will give a few personal observations about the basic math students I have encountered during the past couple of years, since that assessment establishes part of the rationale for my subsequent recommendations.

When I began focussing on the problems associated with basic math courses, it was the high attrition rates which initially caught my attention. I proceeded on the assumption that converting to "self-paced" classes, in which every student could control the time of each test until he / she was prepared for it, would enable many of the formerly unsuccessful students to complete the course. It was my experience that while a few students did benefit from the flexible

testing format, a large percentage of the formerly unsuccessful students remained unsuccessful. Why had this flexible testing format not been successful? The best explanation I can offer is that many of the unsuccessful students lack the self-discipline, study habits and / or motivation to successfully complete these courses. A brief way of describing this situation is to say these students lack "academic maturity".

"Academic maturity" is a characteristic which we, as college faculty, must assure is in every one of our graduates. A normal college course is structured on the assumption that the students are "academically mature"; they are expected to be able to read and comprehend textbooks, do 2-3 hours of homework for every hour in class, and demonstrate adequate knowledge of the subject matter on examinations. Students who cannot meet these standards do not pass the course. While these are standards which must be maintained for our graduates, basic skills courses must go beyond just "screening out" those students who lack "academic maturity"; basic skills courses must provide an opportunity for previously unsuccessful students to develop "academic maturity". The ways in which we might be able to offer such opportunities will be discussed in the "Variable Unit / Self-Paced" section of this document.

Within the "basic skills" sub-population, there are two special problems which will not be directly addressed by the proposed Basic Math Program. One is students with learning disabilities. Math classes provide a good opportunity for identifying students who might have learning disabilities; when a student is making a serious effort to learn but not making much progress, some form of learning disability is suggested. The Basic Math Program will recommend that students seek assistance from the DSPS program whenever that seems appropriate, but it will not attempt to duplicate any of those services. All Basic Math courses will, of course, be open to DSPS students, but the special needs of the learning disabled students are not influencing the recommendations of this proposal.

The other special problem is students who cannot read. When reading comprehension prevents a student from making progress in a Basic Math class, that student will be encouraged to emphasize his / her reading courses. EIS students must be considered on an individual basis since a student who is taking EIS courses to develop English speaking skills may be able to do quite well in a math class.

This Basic Math Program has included courses up to Math 118, the math requirement for our two year degree, since the objective of this program is to give "at risk" students as much opportunity as possible to develop the "academic maturity" which should be associated with a college degree. Those student who are interested in transferring to a four year college should be "academically mature" enough to pass normal college courses, and therefore, no consideration is being given to extending "Variable Unit / Self Paced" instruction past Math 118.

II. "Basic Math Program" Proposal

1. Maintaining a "Fixed Unit / Lecture" Core

This program proposal makes modifications to the existing math curriculum rather than recommend any completely new approach to mathematics instruction. The "Fixed Unit / Lecture" course format remains the primary method of instruction (with each instructor able to adjust his / her teaching methodologies within the constraints of the official course outline). Students will be encouraged to enroll in these "Fixed Unit / Lecture" courses until they have demonstrated their individual inability to be successful with this type of instruction. This constitutes no change from our current procedures. The new aspects of this Basic Math Program proposal apply only to the way we assist students who are not successful with our current method of instruction.

The primary reason for maintaining the "Fixed Unit / Lecture" format is that this method of instruction appears to be the most effective way of getting students to complete a course in one semester. Figure 1 provides some statistical support for that claim. At the same time, it must be acknowledged that the data in Figure 1 does not fairly represent the "Variable Unit / Self-Paced" alternative. The most obvious discrepancy with respect to this "one semester completion rate" calculation is that the "self-paced" alternative has returning students (who cannot complete the course in one semester) included in its base population.

Since all of the "Variable Unit / Self-Paced" data in this document comes from Lynn Stone's classes, it is important to recognize her assessment that all students who are capable of completing the course in one semester do so with her method of "self-paced" instruction. The data in Figure 1 is not intended to disprove Lynn's assertion. My reason for previously stating that "Fixed Unit / Lecture" courses are "the most effective way of getting students to complete a course in one semester" comes from observations of students in my own "self-paced" classes. On several occassions I have seen students, who I believe could have completed the course in one semester, fail to do so because of the inherent lack of pressure to complete a "self-paced" class. This decision is often the very rational one of studying for other classes which have fixed time schedules. Some of these students, who failed to complete a course, enrolled in the next sequential course without completing the last few chapters of the "self-paced" course. I believe these students would benefit from the extra discipline imposed by a "fixed unit" course. While Figure 1 may support my assessment, further data analysis would be required before any such conclusion could be justified.

A fairer way of assessing "Variable Unit / Self-Paced" courses is provided by the "Productivity" calculations which have been presented in my semester reports. These calculations recognize partial unit credit for students who do not complete the entire course in one semester, and therefore, they are a better measure for the amount of learning that occurs in a class. Figure 2 shows "Normalized" Productivity values, which are the previous "Productivity"

calculations divided by the number of units in a course, so that the 3 unit Math 101 and 115 courses can be compared with the 4 unit Math 118 courses. It should be noted that for the "Fixed Unit / Lecture" courses, the "Normalized Productivity" calculations of Figure 2 are exactly the same as the "Percentage of Students Who Completed the Course in One Semester" values of Figure 1.

While the "Normalized Productivity" values of Figure 2 are a fairer way to evaluate "Variable Unit / Self-Paced" courses, caution must be exercised when drawing conclusions from this information. The Math 115 and 118 courses have been included in the "Fixed Unit / Lecture" data because Flor Feldman's Math 101 classes represent only a small number of students. Whether it is appropriate to compare 115 and 118 courses with 101 courses could be debated. Figure 2 can legitimately be used as a justification for maintaining the "Fixed Unit / Lecture" mode of instruction, but it should not be interpreted as a criticism of the "Variable Unit / Self-Paced" methodology. While minor differences in this "preliminary" data do exist, those differences are not sufficient to establish that the productivity of "Variable Unit / Self-Paced" courses is not comparable to the productivity of "Fixed Unit / Lecture" courses. More significantly, "Productivity" calculations do not measure the primary benefit of "Variable Unit / Self-Paced" courses, which is an improvement in the "Continuation of Effort" by students who have trouble passing a "Fixed Unit / Lecture" course.

Another reason for maintaining "Fixed Unit / Lecture" courses is that it minimizes the disruption of instruction by existing faculty. In our concern for the "at risk" students, we should not lose sight of our responsibilities to the "academically mature" students who are prepared to take advantage of the instruction we are currently providing. The "Fixed Unit / Lecture" course is the type of instruction most of these students will encounter when they transfer to a four year college. It would be a disservice to them if the faculty were to abandon that form of instruction out of concern for students who are not prepared to do college level work.

2. Developing a "Safety Net" Transfer System

Since many of the students who enroll in the "Fixed Unit / Lecture" courses do not successfully complete that course during the initial semester, a Basic Math Program should provide assistance to as many of these unsuccessful students as possible. Whenever possible, this assistance would mean transferring the student to an appropriate "Variable Unit / Self-Paced" course during that same semester. If such a transfer is not possible, then at least there should be an effort to inform the student about the alternatives and assistance that are available for a repetition of the course in a future semester.

During the '96-'97 academic year, efforts have been made to inform all students in "Fixed Unit / Lecture" Math 101, 115, and 118 classes about the alternatives and assistance. This information was disseminated through bulletin board notices and classroom visits for verbal announcements. Without going into the details which can be found in my semester reports, I will simply say that these

efforts have not been very effective at getting a productive response from the students, and a greater effort will be necessary in order to establish an effective "Safety Net" transfer system.

The most obvious addition to the current effort would be direct contact by whoever is coordinating the Basic Math Program (probably through phone calls) to students who need assistance. This coordinator will have to maintain good communications with all "Fixed Unit / Lecture" instructors to identify as soon as possible students who need assistance. Since the "Fixed Unit / Lecture" course is considered the most effective way of getting students through a course in one semester, the Basic Math Program coordinator must be careful not to interfere with classroom instruction and to encourage students to remain in those classes as long as there is a reasonable chance that they might successfully complete the course during that semester.

3. Developing "Variable Unit / Self-Paced" Alternative Courses

3.1 "Continuation of Effort" Data

While "Productivity" calculations are important considerations, they do not measure the most significant characteristic of "Variable Unit / Self-Paced" courses, which is the "continuation of effort" by those students who are not able to successfully complete a "Fixed Unit / Lecture" course in one semester. Figures 3 and 4 have been developed to measure this "continuation of effort" characteristic. In both cases, students who have passed the course in one semester and students who have not made a "serious" effort are excluded from these calculations.

Figure 3 shows the percentage of "serious" students requiring a "continuation of effort" who have not enrolled in any CCC classes during the next full semester after having been unable to successfully complete one of the Basic Math courses. (In some cases, recognition has been given to summer session enrollment.) Lynn Stone's "Variable Unit / Self-Paced" classes have produced a "drop-out rate" that is more than 10% lower than the "drop-out rate" for Flor Feldman's "Fixed Unit / Lecture" classes, but caution is advised since Flor's data represents so few students. The 115 comparison is favorable to the "Variable Unit / Self-Paced" courses, but the 118 comparison shows no significant difference. Again, we must be cautious about comparing 101, 115, and 118 courses with each other. Perhaps the 118 students are more motivated to enroll the next semester since they are closer to a two year degree, and the statistical comparison measures more than just differences between "Fixed Unit / Lecture" and "Variable Unit / Self-Paced" modes of instruction.

Figure 4 takes the "serious" students who have enrolled during the next full semester and shows the percentage of these students who have included a math course in their schedule of classes. Lynn's "Variable Unit / Self-Paced" classes have better than 75% of the students continuing their math studies, whereas the "Fixed Unit / Lecture" Math 115 and 118 courses have 55%-60% of

the students continuing their math studies. The 73% rate for Flor's "Fixed Unit / Lecture" course is probably influenced by the availability of Lynn's "Variable Unit / Self-Paced" alternative. (Remember, students who have successfully completed the Basic Math course in one semester and students who did not made a "serious" effort are excluded from the data in Figures 3 and 4.)

As with the "Productivity" calculations, these "Continuation of Effort" statistics must be viewed as merely preliminary data. At this point in time, both sets of data are probably more valuable for defining how "Fixed Unit / Lecture" and "Variable Unit / Self-Paced" courses can be compared rather than for any conclusions that can be established based on those comparisons.

3.2 Differences Between Lynn Stone's Approach and Mine

While Lynn Stone's classes are the only ones listed in the accompanying data as being "Variable Unit / Self-Paced", she is not the only instructor who has been using that methodology during the past couple of years. The 101 courses I taught using computers as the principal source of instruction were also "Variable Unit / Self-Paced", but since the "Productivity" of those classes was only about half of the "Productivity" for Lynn's classes, I am no longer trying to use computers in that manner. Using that "computer instruction" data in this report would have been unfairly prejudicial against the "Variable Unit / Self-Paced" methodology.

Reliance on computers for instruction has not been the only difference between Lynn Stone's approach to "Variable Unit / Self-Paced" instruction and mine. Lynn's own estimate for the time she spents on three sections of Math 101 is 40-50 hours per week. A reasonable expectation for a part-time instructor teaching a .6 FTE would be 18-24 hours per week (with the variability due to allowance for a full-time instructor's 40 hour work week having 5 hours of paid office hours and an additional requirement to attend committee / management meetings). Part of Lynn's "overload" is due to her willingness to accept more than 40 students per section, but her methodology also contributes to her "overload". There is no question about the effectiveness of Lynn's methodology. However, if we are going to use her methodology as a basis for developing the "Variable Unit / Self-Paced" aspects of the Basic Math Program, we must recognize that we cannot expect other instructors to be as generous with their time as Lynn has been. Consequently, there is a need to analyze what Lynn has been doing and apply it in a manner which would be consistent with the normal work-load expectations for instructors.

Figure 5 breaks down Lynn's methodology into specific activities and compares them to the activities I include in my approaches to "Variable Unit / Self-Paced" instruction. The distinctions of "C" and "A&B" refer to "Variable Unit / Self-Paced" courses which either cover the same material as the corresponding "Fixed Unit / Lecture" course, "C", or divide the corresponding "Fixed Unit / Lecture" course into two sequential "Variable Unit / Self-Paced" course, "A&B". To date, I have only used the "C" course structure. As can be seen from Figure 5, my "C" instruction is not the same as Lynn's. By using a "Study Hall"

format I could accomplish within the "C" course structure some of the additional things Lynn does, but to match her methodology, I would want to use the "A&B" course structure. Details about these differences will be discussed in the following pages.

3.2.1 My "C" Course Format

There are two ways I have used the "C" format beyond the "computer instruction" classes. One is as an "auxillary" to a "Fixed Unit / Lecture" course I teach; this occurred in my Math 101-01 section during Summer '96, and I am doing it again this semester, Spring '97, with my Math 115-02 class. The second way is as a "safety net" for students who are dropping-out of "Fixed Unit / Lecture" courses being taught by other instructors; I have been experimenting with this approach during the '96-'97 academic year.

With the "auxillary" approach, students are transferred into the "Variable Unit / Self-Paced" course when it becomes obvious that they will not be able to successfully complete the "Fixed Unit / Lecture" course. While I may suggest to a student that I think this transfer would be advisable, the decision is left to the student. When they transfer, they have an opportunity to restudy prior chapters and repeat those chapter tests which they did not pass. Credit is given for any chapter tests which were passed in the "Fixed Unit / Lecture" course, and the semester grade is based on the average score of the chapter test which have been passed. The problem with this "auxillary" approach is that most of my attention in the classroom is focussed on those students who are still trying to complete the "Fixed Unit / Lecture" course. Students who have transferred to the "Variable Unit / Self-Paced" course must study under their own supervision, with my principal activity being scheduling, monitoring, and grading their tests. This is not adequate since most of these students are the ones who lack the self-discipline, study habits, and / or motivation to be successful students.

Despite the deficiency of this "auxillary" format, it is the format I would use to teach any Math 101C, 115C, or 118C course that was listed in the Schedule of Classes. I would make this choice for two reasons. One is my primary responsibility to those students who are capable of completing the course in one semester. The other reason is consideration for my own work-load. When I use the "Fixed Unit / Lecture" format, I believe I am reasonably close to meeting the 18-24 hour per week work-load expectation that has been described for a .6 FTE part-time instructor. Anything I do for "Variable Unit / Self-Paced" instruction is additional work, so I am very reluctant to go beyond the additional testing tasks described in the preceding paragraph. Since I acknowledge that this "auxillary" format is not very effective for students who lack "academically maturity", I am very cautious about recommending it as a vital component for the Basic Math Program.

There is one situation, however, in which this "auxillary" format may make a valuable contribution to the Basic Math Program; that situation is as part of the "Safety Net" transfer system. Since students will be dropping-out of

"Fixed Unit / Lecture" course which have been scheduled anywhere between 8 AM and 3 PM, scheduling conflicts will undoubtedly prevent some of these students from being transferred directly into a "Variable Unit / Self-Paced" course using more of Lynn's methodology during that immediate semester. For those students, the "auxillary" format, which is what I have been using as a "safety net" during this '96-'97 academic year at the Skills Center, may be an effective way of transferring them to a more appropriate "Variable Unit / Self-Paced" course in the next semester.

3.2.2 A "Study Hall - C" Course Format

This format is close to Lynn's approach except that it does not include lectures or fixed tesing times. Those activities are emphasized in the "Fixed Unit / Lecture" format, and trying to incorporate them into the "Study Hall" format would create the work over-load problem which was described in the preceding discussion. One of the reasons I would not want to use this format for a Math 101C, 115C, or 118C course that had been listed in the Schedule of Classes is that I believe too many of the students who are capable of completing the course in one semester would not do so.

Even though I am not recommending this "Study Hall" format for the Basic Math Program, it is helpful to evaluate it since it includes some of the key activities in Lynn's methodology.

The most obvious gain with the "Study Hall" format compared to the "auxillary" format is that the instructor can give direct attention to the "self-paced" students. This enables the instructor to "require" attendance. Since many of these students lack self-discipline and good study habits, "requiring" attendance is the first step in an effort to convert them into "academically mature" students. While attendance should be "required", grading should remain based solely on demonstrated knowledge of the subject matter.

The emphasis in the "Study Hall" format is on doing at least part of the homework assignments in class. Most of these students are not successful in "Fixed Unit / Lecture" courses because they fail to do adequate homework. By requiring students to do homework in class, not only is the "Study Hall" format helping students learn math, it is also contributing to the development of "academically mature" students. Completion of homework assignments for each chapter should be a pre-condition for taking each chapter test, and when possible, computer program work should be accepted as an alternative way to complete the homework assignment for a chapter. The degree to which homework assignments need to be graded should be left to the individual instructors. Grading homework can become a very time consuming task, and it doesn't achieve anything which cannot be accomplished by a thorough grading of test papers (since students will be permitted to repeat any test they do not pass).

Another advantage of the "Study Hall" format is that it permits the use of tutors in the classroom. My only reluctance in recommending tutors is that when I have taught classes using this format, I have not been overburdened by

questions from the students. Lynn, on the other hand, feels she is getting valuable assistance from her tutors. It is quite possible that if I had tutors in a "Study Hall" class, students would find it easier to form study groups with these tutors than to seek assistance from the instructor. Another form of tutoring is provided by the computer programs at the Skills Center; attendance of students excused from class to study on these computers can be monitored by the "clock-in" computer at the Skills Center.

When a course is being taught in the "self-paced" mode, regardless of which approach is being used, the instructor will have considerably more management record-keeping to do than when the course is taught with "Fixed Unit / Lecture" methodology. At the very least, the instructor must keep track of who is going to take which test when. If a student is not attending classes regularly, then additional phone calls are also required. I have found that a notebook with "contact sheets" for each student and "test calendars" for each month are adequate for this management task.

Because of the minimal classroom work required from an instructor using the "Study Hall" format, the additional management record-keeping should not be considered as an unacceptable work-load burden. I am reluctant to use the "Study Hall" format because it is so similar to the type of class I had when I was experimenting with "computer instruction", and I am afraid that a similar low "Productivity" would result.

3.2.3 My "A&B" Course Format

The "Study Hall" format provides an opportunity for "at-risk" students to both learn math and develop the "academic maturity" they need, but the instructor is so passive in this format that it is difficult to keep many of the students active in their studies. By reintroducing "lectures" and "fixed testing times for the entire class", the instructor is better able to provide the leadership which helps "push" students through a course. This is basically what Lynn Stone does in her classes. However, if you are going to devote a portion of your classroom time to "study hall" activities, then there won't be enough time for the same "lectures" that are provided in the "Fixed Unit / Lecture" course. If you want both the same amount of lecture and also study hall activity, one response is to divide the "Fixed Unit / Lecture' course into two sequential courses. For example, "Variable Unit / Self-Paced" Math 115A and 115B would be equivalent to "Fixed Unit / Lecture" Math 115.

This response assumes that the "lectures" are valuable and therefore worthy of being kept as part of the course. It is quite legitimate to question that assumption. In most math classes, "lectures" emphasize a review of homework assignments and are not just discussions about new material and general theories. These "lectures" are answering the same questions for an entire class that a tutor would answer for an individual student in a study hall, and hence, they are an efficient way to disseminate information about how to do mathematical calculations. Granted, some students will want to have those explanations repeated, and that is why having a study hall as part of the

classroom activity will be helpful. Up to a certain point, the more that can be said in a "lecture", the less that will have to be said again and again as different students ask the same question. Since "at-risk" students need more explanation than "academically mature" students about how to do mathematical calculations, it seems difficult to justify providing them with less "lecture" than is currently given in the "Fixed Unit / Lecture" course.

Dividing a "Fixed Unit / Lecture" course into two sequential courses has more advantages that just providing time for study hall activity. Since only half of the original course material will be covered each semester, the pace of the lectures will be slower and thereby allow more of the "at-risk" students to keep up with the class. Furthermore, since the course's subject matter is divided into two courses, those students who are studying on a self-paced basis will have a greater chance to benefit from the lectures because the lectures will be closer to the material they are studying. (For example, if a course consist of six chapters, a self-paced student studying Chapter 5 will not have to sit through lectures on Chapters 1-3, nor will a student who is still studying Chapter 2 be bothered by lectures on Chapters 4-6.)

The "variable unit / self-paced" aspects of the A&B format are as important as the "lecture / fixed testing time" aspects, but it is hoped that the slower pace of these courses will enable more students to keep up with the pace of the course and avoid "self-paced" study. Not only would this make it easier to "push" the students through the course, it would also reduce the amount of management record-keeping and phoning that the instructor would have to do. I can provide no assurance that this A&B course format will be effective. Only a few experimental classes can provide that answer. For the reasons I have tried to explain, this is simply the best alternative I can propose for addressing the math difficulties confronting our "at-risk" students.

3.3 Scheduling Alternatives

Figures 6A-6C present the overall scheduling considerations for Basic Math courses and the instructor work-loads associated with those schedules. Figure 6A shows the current "day-time" Basic Math classes for the '96-'97 academic year. The only "self-paced" courses student can register for are the three 101C sections taught by Lynn Stone. Students who are having difficulty in "fixed unit" 101, 115, or 118 courses can transfer into the "self-paced" courses I am offering at the Skills Center, but with the exception of the students in my 115-2 section during the Spring '97 semester, very few students are using these alternatives. As explained in section 3.2.1, there are reasons for not encouraging too many students into this form of "self-paced" instruction.

Figure 6B shows how the current schedule could be modified to provide "Variable Unit / Self-Paced" classes for each of the Basic Math courses. Lynn Stone would continue teaching her three 101C sections, while students would be able to register for one section of 115A, 115B, 118A, and 118B. The 101C, 115C, and 118C "auxillary" sections would still be available at the Skills Center as a

"safety net" transfer system, but given the minimal use of those courses, the instructional work-load can be dropped from 0.4 FTE to 0.2 FTE. (However, keep in mind that my report writing is being paid for from that current 0.4 FTE.)

Assuming that the A&B format proves to be effective, in the long run the number of "Fixed Unit / Lecture" and "Variable Unit / Self-Paced" sections for any Basic Math course would be determined by student registration. To estimate the financial impact this change would have, Figure 6C shows the FTE work-load that would result if 50% of the current enrollment were to choose "Variable Unit / Self-Paced" sections for each of the Basic Math courses. The overall impact would be an increase of approximately 1.5 FTE.

Please note that while Figure 6C shows 101A and 101B courses, there is no intention of suggesting that Lynn Stone should change her current way of teaching 101C. The 101A and 101B courses have been introduced in Figure 6C to show the overall financial impact if Lynn were no longer teaching at CCC, and the A&B format was considered the most appropriate way to structure the work-load for her replacement.

When looking at the Basic Math curriculum, it can be noticed that certain topics are repeated. For example, the material in 118A is essentially the same as in 115; also, proportions and percentages occur in both 101 and 115. No attempt is being made to "streamline" the Basic Math Program by eliminating these duplications. On the contrary, it is recommended that these repetitions be maintained to improve the mathematical knowledge of the "at-risk" students who will be studying in this program.

PERCENTAGE OF STUDENTS

WHO COMPLETE COURSE IN ONE SEMESTER

		Total Enrollment	Enrollment After WX
Fixed Unit / Lecture			
Math 118	Fall '96	88/281 = 31.3%	88/203 = 43.3%
Math 115	Fall '96	62/246 = 25.2%	62/188 = 33.0%
Math 101 (Feldman)	Fall '95	12/ 42 = 28.6%	12/ 31 = 38.7%
	Fall '96	10/ 29 = 34.5%	10/ 18 = 55.6%
		22/ 71 = 31.0%	22/ 49 = 44.9%
Variable Unit / Self-Paced			
Math 101 (Stone)	Fall '95	16/159 = 10.1%	16/ 86 = 18.6%
	Spring '96	21/158 = 13.3%	21/119 = 17.6%
	Fall '96	25/219 = 11.4%	25/157 = 15.9%
		62/536 = 11.6%	62/362 = 17.1%

Unfair Aspects of Comparison for Variable Unit Courses

1. Base population is not as "random" as for Fixed Unit courses since "slow" students are returning from prior semesters.

2. Calculation doesn't recognize "partial unit" accomplishments.

3. Calculation doesn't attempt to measure the characteristic for which Variable Unit is most valuable, Continuation of Effort.

Special Interpretations for Variable Unit Courses

1. Course is completed if either 3 or 2.5 units are passed.

2. Since WX is not recorded for variable units classes, students with less that 5 hours attendence are dropped from Total Enrollment.

Figure 1

"NORMALIZED" PRODUCTIVITY

(Productivity -- Course Units)

"Normalized Productivity" has same numerical value as "Percentage of Students Who Complete Course in One Semester" for Fixed Unit Courses.

		Total Enrollment	Enrollment After WX
Fixed Unit / Lecture			
Math 118	Fall '96	.313	.433
Math 115	Fall '96	.252	.330
Math 101 (Feldman)	Fall '95	.286	.387
	Fall '96	.345	.556
		.310	.449
Variable Unit / Self-Paced			
Math 101 (Stone)	Fall '95	.226	.419
	Spring '96	.280	.371
	Fall '96	.240	.334
		.248	.366

Unfair Aspects of Comparison for Variable Unit Courses

1. Base population is not as "random" as for Fixed Unit courses since "slow" students are returning from prior semesters.
2. Calculation doesn't attempt to measure the characteristic for which Variable Unit is most valuable, Continuation of Effort.

Unfair Aspects of Comparison for Fixed Unit Courses

1. Calculation doesn't recognize learning by D, F, and W students.

Special Interpretations for Variable Unit Courses

1. Course is completed if either 3 or 2.5 units are passed.
2. Since WX is not recorded for variable units classes, students with less that 5 hours attendence are dropped from Total Enrollment.

Figure 2

DROP-OUT RATES

Percentage of Students "Requiring a Continuing Effort"
Who Do Not Enroll for Any CCC Classes the Next Semester

Fixed Unit / Lecture

Math 118	Fall '96	38/110 = 34.5%
Math 115	Fall '96	56/122 = 45.9%
Math 101 (Feldman)	Fall '95	10/ 19 = 52.6%
	Fall '96	2/ 8 = 25.0%
		12/ 27 = 44.4%

Variable Unit / Self-Paced

Math 101 (Stone)	Fall '95	17/ 70 = 24.3%
	Spring '96	33/ 98 = 33.7%
	Fall '96	46/132 = 34.8%
		96/300 = 32.0%

Definition of Students "Requiring a Continuing Effort"

Fixed Unit Courses : Students who received a grade of D, F, or W.

Variable Unit Courses : Students who received a passing grade for less than 2.5 units, and students who received a W but attended 5 hours or more of class.

Figure 3

MATH CONTINUATION

Percentage of Students "Requiring a Continuing Effort"
Who Enroll for the Next Semester and Take a Math Course

Fixed Unit / Lecture

Math 118	Fall '96	43/ 72 = 59.7%
Math 115	Fall '96	36/ 66 = 54.5%
Math 101 (Feldman)	Fall '95	6/ 9 = 66.7%
	Fall '96	5/ 6 = 83.3%
		11/ 15 = 73.3%

Variable Unit / Self-Paced

Math 101 (Stone)	Fall '95	43/ 53 = 81.1%
	Spring '96	43/ 65 = 66.2%
	Fall '96	69/ 86 = 80.2%
		155/204 = 76.0%

Definition of Students "Requiring a Continuing Effort"

Fixed Unit Courses : Students who received a grade of D, F, or W.

Variable Unit Courses : Students who received a passing grade for less than 2.5 units, and students who received a W but attended 5 hours or more of class.

Figure 4

ANALYSIS OF " VARIABLE UNIT / SELF-PACED " METHODOLOGIES

	Lynn's "C"		My "C"		Study Hall "C"	My "A&B"
1. Open Entry / Exit	Yes		Yes		Yes	Yes
2. Variable Unit Credit	Yes		Yes		Yes	Yes
3. Testing						
a. Fixed Time for Entire Class	Yes	#	No	#	No	Yes
b. Test When Student Is Ready	Yes		Yes		Yes	Yes
c. Repeat If Test Not Passed	Yes		Yes		Yes	Yes
4. "Required" Attendance	Yes	#	No		Yes	Yes
5. Lectures	Yes	#	No	#	No	Yes
6. Homework						
a. Done In Class	Yes	#	No		Yes	Yes
b. Complete Prior to Test	Yes		Yes *		Yes	Yes
c. Graded / Reviewed	Yes		No		?	?
7. Computer Support	Yes		Yes		Yes	Yes
8. Tutors in Class	Yes	#	No		Yes ?	Yes ?
9. Phone Calls by Instructor						
a. Poor Attendance	Yes		Some		Yes	Yes
b. Test Scheduling	Yes		Yes		Some	Some
c. Tutoring	Yes		No		No	?
d. Other	Yes		No		No	No
10. Management Recordkeeping						
a. Attendance	Yes		Some		Yes	Yes
b. Test Scores	Yes		Yes		Yes	Yes
c. Test Scheduling	Yes		Yes		Yes	Yes
d. Homework	Yes		No		?	?
e. Phone Calls	Yes		Yes		Yes	Yes

Notes: # Indicates important difference from Lynn's methodology.
* In theory, but difficult to enforce.

Figure 5

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BASIC MATH PROGRAM

CURRENT SCHEDULE

(Night Classes Excluded)

Course	Number of Sections	FTE	Notes
118	6	1.6	
115	2-4	0.4-0.8	
101	2	0.4	
101C	3	0.6	1
		1.0	
Skill Center Support		0.4	2
		3.4 - 3.8	

Notes:

1. Lynn Stone's sections

2. Includes 101C, 115C, and 118C "safety net" course as "auxillary" support for student dropping-out of the "Fixed Unit / Lecture" courses. This instructional work-load could be cut in half without any noticable reduction in service to the students. (The current 0.4 FTE also pays for Basic Math report preparations.)

Figure 6A

BASIC MATH PROGRAM

MINIMAL "VARIABLE UNIT / SELF-PACED" COVERAGE

(Night Classes Excluded)

Course	Number of Sections	FTE	Notes
118	5	1.333	
118A	1	0.267	
118B	1	0.267	
		1.867	
115	1-3	0.2-0.6	
115A	1	0.2	
115B	1	0.2	
		0.6-1.0	
101	2	0.4	
101C	3	0.6	1
		1.0	
Skill Center Support		0.2	2
		3.7 - 4.1	

Notes:

1. Lynn Stone's sections

2. Includes 101C, 115C, and 118C "safety net" course as "auxillary" support for student dropping-out of the "Fixed Unit / Lecture" courses who cannot be scheduled into the other "Variable Unit / Self-Paced" courses.

Figure 6B

BASIC MATH PROGRAM

A 50% "VARIABLE UNIT / SELF-PACED" FUTURE

(Night Classes Excluded)

Course	Number of Sections	FTE	Notes
118	3	0.8	
118A	3	0.8	
118B	3	0.8	
		2.4	
115	1-2	0.2-0.4	
115A	1-2	0.2-0.4	
115B	1-2	0.2-0.4	
		0.6-1.2	
101	2	0.4	
101A	3	0.6	1
101B	3	0.6	1
		1.6	
Skill Center Support		0.2	2
		4.8 - 5.4	

Notes:

1. Assumes that Lynn Stone is no longer teaching her 101C courses and that those sections have been converted to the A&B format

2. Includes 101C, 115C, and 118C "safety net" course as "auxillary" support for student dropping-out of the "Fixed Unit / Lecture" courses who cannot be scheduled into the other "Variable Unit / Self-Paced" courses.

Figure 6C

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